APPENDIX B
CHEMICAL OPERATIONAL PARAMETERS

These guidelines set forth the suggested operational parameters for the proper chemical treatment and maintenance of swimming pool waters. Except where specifically noted, they apply to indoor and outdoor pools, in-ground, on-ground, and above-ground pools. However, some above-ground pools may require somewhat higher chlorine concentrations, more frequent superchlorination, and more brushing or manual activity to maintain the proper pool water quality because of unusual contamination or other adverse conditions.

Chemical treatment alone will not produce sanitary pool water. A filtration system in proper operational condition is also required to attain sparkling clear, polished sanitary pool water.

A. DISINFECTANT LEVELS

		MINIMUM	*IDEAL*	*MAXIMUM*	*COMMENTS*
1.	Free chlorine, p/m	1.0	1.0-1.5	3.0	Note: Chlorine should be maintained at this level continually. Super chlorinate regularly. See F-#3 below.
2.	Combined chlorine, p/m	0.0	0.0	0.2	If combined chlorine is too high you may have: ●Sharp chlorinous odors ●Eye burn ●Algae growth Bacteria growth* (*Combined chlorine is eliminated by superchlorination.)
3.	Bromine, p/m	0.8	1.5	3.0	Note: Health department officials should be consulted before use.
4.	Iodine, p/m	1.0	1.5	5.0 (Includes all forms)	Note: Health department officials should be consulted before use. May discolor water. Ineffective against algae.

B. CHEMICAL VALUES

1.	pH	7.2	7.5	7.8	If pH is: *TOO HIGH* ●Lowers chlorine effectiveness ●Scale formation ●Cloudy water ●Increased chemical demand ●Eye discomfort	*TOO LOW* ●Rapid dissipa- of chlorine ●Plaster/concrete etching ●Eye discomfort ●Corrosion of metals
2.	Total alkalinity, as $CaCO_3$, p/m	80	100	200	If total alkalinity is: *TOO LOW* ●pH bounce ●Corrosion tendency	*TOO HIGH* ●Cloudy water ●Increased scaling potential ●pH maintained too high

		MINIMUM	*IDEAL*	*MAXIMUM*	*COMMENTS*
3.	Undissolved solids, p/m	None	None	None	If undissolved solids are: *TOO HIGH* ●Filter is not working properly ●Unsightly water
4.	Dissolved solids, p/m	300		1500	If dissolved solids are: *TOO LOW* ●Total alkalinity may be too low ●Aggressive water *TOO HIGH* ●Chlorine may be less effective ●Scaling may occur ●Freshwater should be added to reduce solids ●Salty taste ●Dull water ●Chemical balance difficult to maintain
5.	Hardness, p/m as $CaCO_3$	50	125	800	If hardness is: *TOO LOW* ●Plaster or concrete etching may occur ●Corrosion *TOO HIGH* ●Scaling may occur ●Water has bad "feel" ●Short filter runs
6.	Copper, p/m	None	None	0.3	If copper content is: *TOO HIGH* ●Staining may occur ●Water may discolor ●Chlorine dissipates rapidly by decomposition ●Filter may plug ●May indicate pH too low, corrosion, etc.
7.	Iron, p/m	None	None	0.2	If iron content is: *TOO HIGH* ●Staining may occur ●Water may discolor ●Chlorine dissipates rapidly ●Filter may plug

C. BIOLOGICAL VALUES

1.	Algae	None	None	None	If algae are observed: Superchlorinate or shock treat pool Supplement with brushing and vacuuming Maintain adequate free chlorine residual Use approved algicide according to label directions
2.	Bacteria	None	None	Refer to local health code	If bacteria count exceeds Health Department requirements Superchlorinate pool and follow proper maintenance procedures Maintain proper free chlorine residual

		MINIMUM	*IDEAL*	*MAXIMUM*	*COMMENTS*
D.	**STABILIZER**				
1.	Cyanuric Acid	30		150: except where limited by health department requirements (often to 100 p/m)	If stabilizer: *TOO LOW* ● Chlorine residual rapidly destroyed by sunlight *TOO HIGH* ● May exceed health department regulations Note: Stabilizer is not needed in indoor pools
E.	**ALGICIDES**				
1.	Quaternary algaecides, p/m	1	3	5	Note: May not be permitted in public pool. Health Department officials should be consulted. Quats may be absorbed by the filter. Quats may create a chlorine demand Ineffective against some algae May cause foaming
2.	Mercury-based algaecides	None	None	None	Note: Mercurials have been banned by the U.S. Environmental Protection Agency because of toxicity hazard.
3.	Copper-based algaecides (nonchelated), p/m	0.1	0.2	03	Note: Ineffective against some algae. Health Department officials should be consulted before using. May contribute to staining.
4.	Copper-based algaecides (chelated), p/m	0.1	1.0	3.0	Note: See Note #3 above.
F.	**REMEDIAL PRACTICES**				
1.	Superchlorination frequency	Monthly	When combined chlorine is 0.2 p/m or more	Weekly	Note: Some high use spas and pools may need superchlorination three times a week or more.
2.	Required superchlorination chlorine, p/m	5	10		
3.	Required shock treatment chlorine, p/m	10	—		
4.	Floccing frequency	—	When needed	—	Note: Floc only to maintain water clarity and supplement filtration.
G.	**TEMPERATURE**				
1.	Temperature, F	Bather preference	82	95	If temperature is: *TOO LOW* ● Bather discomfort *TOO HIGH* ● Excessive fuel requirement ● Increased evaporation ● Bather discomfort ● Increased scaling potential ● Increased use of chlorine

	MINIMUM	*IDEAL*	*MAXIMUM*	*COMMENTS*	
H. WATER CLARITY					
1. Water turbidity, Jackson Turbidity Units	0	0.5 or less	1.0	If water turbidity is:	*TOO HIGH* ● Chlorine level may be too low ● Filtration system may be inoperative ● Too turbid water may inhibit the effectiveness of lifeguards because of reduced visibility